



Vol. 2, No. 14
5 October 1987

Science and Technology Perspectives

DEVELOPMENTS

Lasers

(USSR) Physicists at the USSR Academy of Sciences' General Physics Institute have claimed a breakthrough with the development of a neodymium-doped crystal laser that operates at 10 percent efficiency. The conversion ratio of the laser's output to energy expended for exciting its medium is reportedly twice as high as that of US-manufactured neodymium crystal solid-state lasers, with the Soviet device having 10 times the power of the US-manufactured laser. The new laser has applications in the cutting and drilling of extremely hard materials such as chromium-vanadium steel plates. (Moscow SOTSIALISTICHESKAYA INDUSTRIYA 18 Jul 87) John H. X2723

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PERSPECTIVES selections are based solely on foreign press, books and journals, or radio and television broadcasts. Some of the materials used in this publication will appear as abstracts or translations in FBIS serial reports. Comments and queries regarding this publication may be directed to the Managing Editor (Craig M.) or to individuals at the numbers listed with items.

STAT

Correction: In the Ceramic Engine item on p 1 of Vol. 2, No. 11, "The Ministry of International Trade and Industry (MITI) has launched" should read "plans to launch"; "40 percent increase in fuel efficiency" should read "in thermal efficiency"; and "Anticipating 20 billion yen in development costs" should read "Anticipating 20 billion yen in development costs from 1988 through 1996."

FOR OFFICIAL USE ONLY**DEVELOPMENTS**

DEVELOPMENTS highlights worldwide S&T events reported in the foreign media. Items followed by an asterisk will be published by FBIS. The contributor's name and telephone number are provided.

Advanced Materials

(Japan) The Engineering Test Satellite (ETS-V) was launched on 27 August from Tanegashima on an H-2 booster. The satellite, which weighs 550 kilograms, uses 70 kilograms of domestically manufactured carbon fiber reinforced plastics for basic structural materials, solar panels, a 20-kilogram central cylinder, the antenna, and some 70 internal components. The only imported materials used for the satellite were carbon/carbon composites for connectors in the apogee motor. (For additional information on the ETS-V, see the feature article on pp 8-9.) (Tokyo NIKKAN KOGYO SHIMBUN 23 Jun 87) Junko A. X2726

(EC) Technical ceramics and composites are the focus of 90 R&D projects recently chosen for funding under the pan-European EURAM (European Research on Advanced Materials) Program. The EC will provide a total of ECU25 million to finance up to 50 percent of each individual project. (Paris COMPOSITES ET NOUVEAUX MATERIAUX 16 Jul 87) Eva L. X2519

Erasable Optical Storage

(Netherlands) Researchers at Philips Physical Laboratory have discovered a group of materials for making erasable optical compact disks. Semiconducting materials such as gallium antimonide (GaSb) and indium antimonide (InSb), to which certain other elements have been added, exhibit differences in reflectivity between their crystalline and amorphous forms. Information is recorded by using a relatively powerful laser beam to heat small areas in a thin layer of crystalline material to just above the melting point. The spots become amorphous on cooling and are optically detectable in their crystalline surroundings. The differences in reflectivity are sufficient to reproduce analog as well as digital signals. Laser heating to just below the melting point causes the spots to return to a crystalline structure. This can be repeated some 1,000 times—ample for consumer use, but not yet sufficient for business applications. (Amsterdam COMPUTERWORLD 21 Jul 87)* Antwerp Unit/Sharon W. X2519

Factory Automation

(UK) The 1,500 steel, aluminum, and titanium parts for the Tornado aircraft will be manufactured in as little as three days (instead of the current 16-week turnaround) using a new flexible workshop scheduled to begin operation at British Aerospace by year's end. The workshop consists of 30 machine tools, a magazine with 80,000 tools, and two wire-guided vehicles. The parts will be machined from cut plates mounted on pallettes that move automatically through the shop. (Paris ROBOTS 23 Jul 87) Eva L. X2519

FOR OFFICIAL USE ONLY**Neural Networks**

(France) The Laboratory for Network Dynamics at the University of Paris V has developed two new expert systems (ES) based on neural networks, a type of computer architecture in which data patterns are learned and compared. (For previous reporting on neural networks, see PERSPECTIVES Vol. 2, No. 9 pp 9-13.) One of the new systems diagnoses abdominal ailments with a 60 percent accuracy rate using information learned from a special data base, while the other ES, a pattern recognition system, can learn up to five type fonts from digitized photographs and recognize the various font letters with claimed 100-percent accuracy. (Paris ZERO UN INFORMATIQUE 13 Jul 87) Eva L. X2519

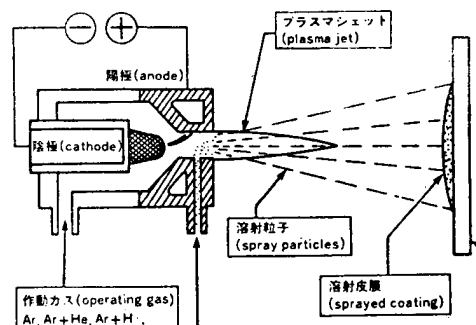
Nuclear Research

(Japan) The Japan Atomic Energy Research Institute (JAERI) has contracted with five Japanese firms (Mitsubishi Heavy Industries, Fuji Electric, Toshiba, Hitachi, and Kawasaki Heavy Industries) to build a high-temperature test reactor in FY89. The reactor, which will be 29 centimeters in diameter, have a 30,000 kilowatt output, and be able to sustain a temperature of 1,000°C, will use slightly enriched coated particle uranium. The unit will have a graphite moderator and will be cooled by helium gas. Budgeted at 90 million yen, the reactor will be used for metal and ceramics testing, nuclear instrument development, advanced nuclear plant control systems development, hydrogen production, and coal liquefaction and gasification technology. (Tokyo NIHON KOGYO SHIMBUN 20 Jul 87) Mitchy E. X2726

(Japan) The Japan Atomic Energy Research Institute (JAERI) reportedly has confined high-temperature plasma for nuclear fusion using the electron-cyclotron-heating (ECH) method. A JFT-2M tokamak-type test device was used to minimize plasma leak and ensure continuous heating. (Tokyo NIHON KEIZAI SHIMBUN 28 Jul 87) Mitchy E. X2726

Superconductivity

(Japan) The National Research Institute for Metals (NRIM) has developed a superconducting thin film with a threshold temperature of 84K and a reported current carrying capacity of 200 amps per square centimeter at 77K. The film is made of yttrium, barium, and copper oxide particles (0.074-0.105 millimeter in diameter) melted by electrolytic disassociation using a high-temperature argon gas plasma. The melted compound is then sprayed as a 0.15-millimeter-thick film onto a Hastelloy substrate, which is heated for one hour at 900°C followed by a second one-hour heating at 500°C. This jet plasma process (see graphic below) reportedly produces a thicker film with higher current density capability than that obtained from sputtering and electron beam methods. (Tokyo NIKKAN KOGYO SHIMBUN 24 Jun 87) Junko A. X2726



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(FRG) Brown, Boveri & Cie (BBC), Dornier, and the Philips Laboratory in Hamburg will each receive DM2.5 million through 1988 from the Federal Research and Technology Ministry (BMFT) for superconductivity research. BBC is studying superconducting fibers (not further identified), while Dornier and Philips Laboratory are researching SQUIDs (superconducting quantum interference devices). In addition, the University of Giessen will receive DM750,000 for SQUID research. (Bonn 1986 BMFT FOERDERUNGSKATALOG Apr 87) Eva L. X2519

FOR OFFICIAL USE ONLY**EC/CEMA: REGULATING GENETIC ENGINEERING?**

Key Points: While the EC Commission is expressing concern over the potential environmental hazards posed by genetically engineered organisms, there are no indications in the press that CEMA has similar concerns. The Commission hopes to develop "risk evaluation" criteria. Taking a harder line, a Bundestag (FRG) report advises a moratorium on the release of new organisms pending the development of national risk criteria.

EC: Regulatory Proposals

As part of its environmental protection program through 1992, the EC Commission is proposing the development of guidelines to regulate the release of genetically engineered organisms into the environment, according to the Bonn journal **TECHNOLOGIE NACHRICHTEN—PROGRAMM INFORMATIONEN** (Mar 87). The initiative is being spearheaded by the Commission's Committee for Biotechnology Research Guidelines (BRIC). Intended to broaden the scope of current EC biotechnology regulations in the food, pharmaceutical, and agricultural industries, the new guidelines would focus on the classification, limitation, and control of the organisms as well as provide for EC-wide notification and approval prior to the introduction of a new organism. The Commission hopes to gain international acceptance for the notification and approval process.

The new guidelines would establish specific risk evaluation criteria by which the Commission would assess the environmental and health merits of a new organism. The criteria would address:

- Production methods and the level of technical understanding, supervision, and control exercised during propagation and diffusion.
- Techniques for release into the environment.
- Accident prevention or emergency procedures in the event of inadvertent release or release resulting from industrial waste disposal.
- Potential threat to human, animal, and plant life as well as to ecosystems.

In an attempt to formalize the Commission's watchdog function, researchers would be obligated to submit all findings to the Commission for evaluation. This approach is being viewed as a means of establishing the Commission's authority in cases involving the laws and regulations of individual members. (For information on strategies being developed to market West European engineered proteins, see **PERSPECTIVES** Vol. 2, No. 4 pp 4-5.)

FRG: Advising Moratorium

The Bundestag report "Promise and Risk of Genetic Engineering" (Dec 86), prepared jointly by members of parliament and technical experts, calls for a minimum five-year FRG moratorium on the release of genetically engineered organisms into the environment. At the end of the five-year period, the Bundestag would consider lifting the moratorium on a case by case basis.

Although supportive of continued research, the report urges that the moratorium be used to improve risk evaluation methods and to develop techniques for monitoring an organism following its release. The five-year period would also be used to prepare safety guidelines governing animal and plant genetic engineering which would be incorporated into epidemic control legislation.

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Paralleling EC Commission efforts to make researchers accountable, the Bundestag report recommends that all laboratories engaged in genetic engineering be registered with a central authority. The report also advises possible banning of certain types (not further identified) of genetic research.

The Paris journal BIOFUTUR (Apr 87) observed that implementing the report could discourage FRG research and, in the worst case, force certain firms to relocate outside the FRG.

CEMA: Product-Minded

Driven by the need to increase food production and an awareness that its efforts to apply genetic engineering lag behind the West, CEMA has made applied biotechnology a top priority, according to a report in the East Berlin journal TECHNISCHE GEMEINSCHAFT (No. 5, 87). In addition to plant and animal husbandry programs, CEMA is using biotechnology in the production of pharmaceuticals and natural resources (notably a Romanian-coordinated project to extract oil and copper). Although the report presents a broad survey of CEMA biotechnology activity and goals, it does not address the issue of environmental protection.

The article highlights a CEMA soil-improvement project involving the USSR, the GDR, Bulgaria, Czechoslovakia, Cuba, and Hungary managed by the Pushchino Institute for Biochemistry and Physiology of Microorganisms (located 100 kilometers south of Moscow). Researchers at the institute are developing a process in which genetically altered bacteria will be used to improve the nitrogen-fixing capability of legumes. The article also reports on a CEMA effort (sponsored by the USSR, the GDR, Poland, Czechoslovakia, and Cuba) at the Mozyr (Belorussia) yeast fodder plant that has yielded protein-rich yeast fodder from petroleum-derived liquid paraffins. As a result of the process, the Soviets have been able to substitute 20 million tons of yeast fodder for grain fodder. (For further information on CEMA biotechnology in food production, see PERSPECTIVES Vol. 2, No. 10 pp 6-7.)

Individual country efforts noted in the article include a lysine synthesis process (allowing reduced fodder consumption) developed by the GDR's Research Center for Biotechnology and the Dessau Zymology VEB; a Czech process for producing protein from wood and cellulose; and antibiotics development by Mongolian researchers. (For detailed information on Bulgarian joint biotechnology ventures, see PERSPECTIVES Vol. 2, No. 12 p 10; for Cuban efforts, see PERSPECTIVES Vol. 2, No. 4 p 8.)

Craig M. X2145

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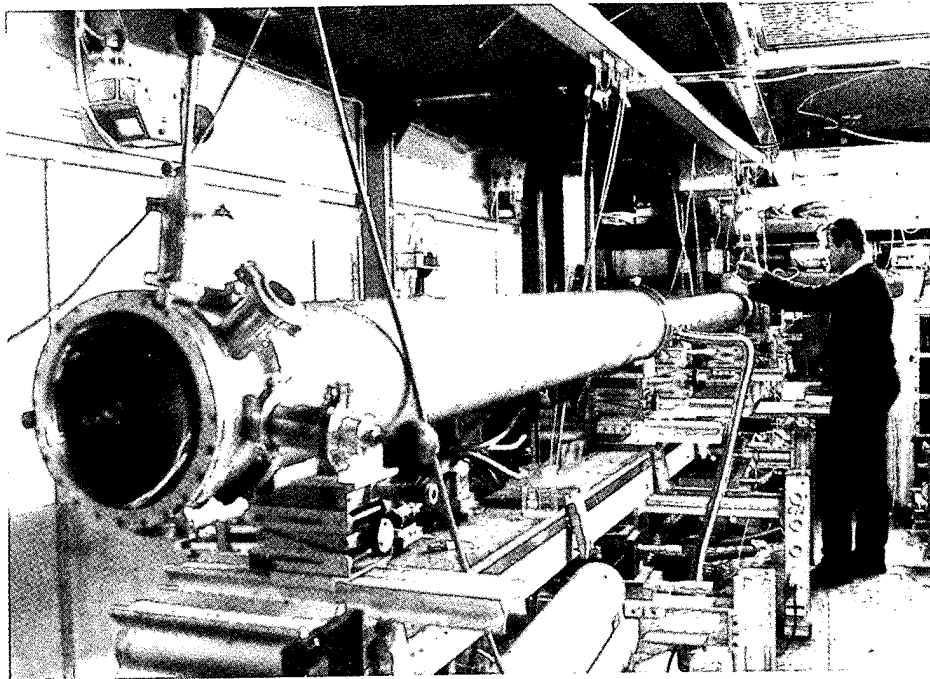
FRG: NEW TECHNIQUES IN PROTEIN ANALYSIS

Key Points: Scientists at the Max Planck Association are using X-rays produced by the German Electron Synchrotron (DESY) and cryogenic techniques to accurately and rapidly measure protein structure and molecular activity, according to BIOTECHNOLOGIE (May 1987). (For previous reporting on bioengineering research and its possible commercial applications, see PERSPECTIVES Vol. 2, No. 4 pp 4-5.)

Current methods for studying biochemical activity in proteins and protein-related compounds involve several days' exposure to conventional X-rays, resulting in damaging levels of irradiation. However, DESY's 100-meter diameter ring produces X-rays 100 to 1,000 times as intense as those from standard X-ray tubes. Used in combination with cryogenic techniques that slow biochemical activity, DESY allows observation of the atomic structures of these substances and reduces to milliseconds the time needed to measure them. Furthermore, the chronological sequence of biochemical reactions can be recorded in a process similar to time-lapse photography due to the strobe-like X-ray pulses emitted by the synchrotron.

This approach has enabled Max Planck researchers to observe and measure the activity of three proteins and protein-related substances: protease (an enzyme that catalyzes the hydrolytic breakdown of proteins), tubulin (a globular protein that organizes itself into hollow rods called "microtubules," which play a role in cell metabolism), and ribosomes (which synthesize protein in cells).

Protease research has resulted in a new method of analyzing the process by which the enzyme bonds with, alters, and splits proteins before returning to its original chemical state. A test-chamber sample of protease is first cooled to a temperature between -5°C and -50°C , at which point a protein is introduced



X-ray diffraction device built by the European Molecular Biology Laboratory. X-rays originate in the synchrotron storage ring behind the protective wall in background.

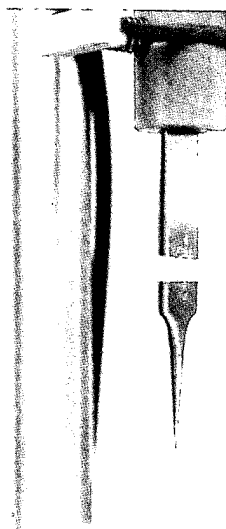
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into the chamber. The solution is warmed to an unspecified temperature to initiate an extremely slow reaction. The test chamber is then placed in a special device connected to the synchrotron and irradiated by X-rays. The device (see picture above) serves as a medium in which the solution's atomic structure diffracts X-rays in characteristic patterns. The X-rays then pass through a vacuum tube and are registered by a sensor. Structural changes occurring within milliseconds have been recorded.

The procedure for studying tubulin involves supercooling the protein (to produce a metastable state) and other associated proteins in the synchrotron. The process of self-organization into microtubules is then triggered by a rapid temperature increase. Structural changes in the tubulin are recorded as in the protease experiments.

Using the device shown below, scientists have developed a method of instantaneously freezing entire ribosomes to -180°C by dropping them into a supercooled liquid (not further identified). The rapidity of the freezing process prevents the formation of potentially damaging ice crystals. Single ribosome crystals are then analyzed in the synchrotron.



In an effort to coordinate this research activity, the Max Planck Association's Institute of Biochemistry (Munich), Institute for Medical Research (Heidelberg), and Institute for Molecular Genetics (Berlin) have established three "Working Groups for Structural Molecular Biology" in Hamburg. The working groups collaborate with the University of Hamburg, the Hamburg Synchrotron Radiation Laboratory (at which DESY is located), and the European Molecular Biology Laboratory (EMBL). This protein research effort is being conducted within the framework of R&D funded by the BMFT (Federal Research and Technology Ministry). The Max Planck Institute for Biochemistry will receive DM9.1 million between 1986 and 1988 for genetic engineering R&D, while the Institute for Molecular Genetics has been allocated DM750,000 from 1985 to 1988 for the study of polypeptide sequences in proteins. (Budget figures and information on specific programs for the Institute for Medical Research are unavailable.)

Eva L. X2519

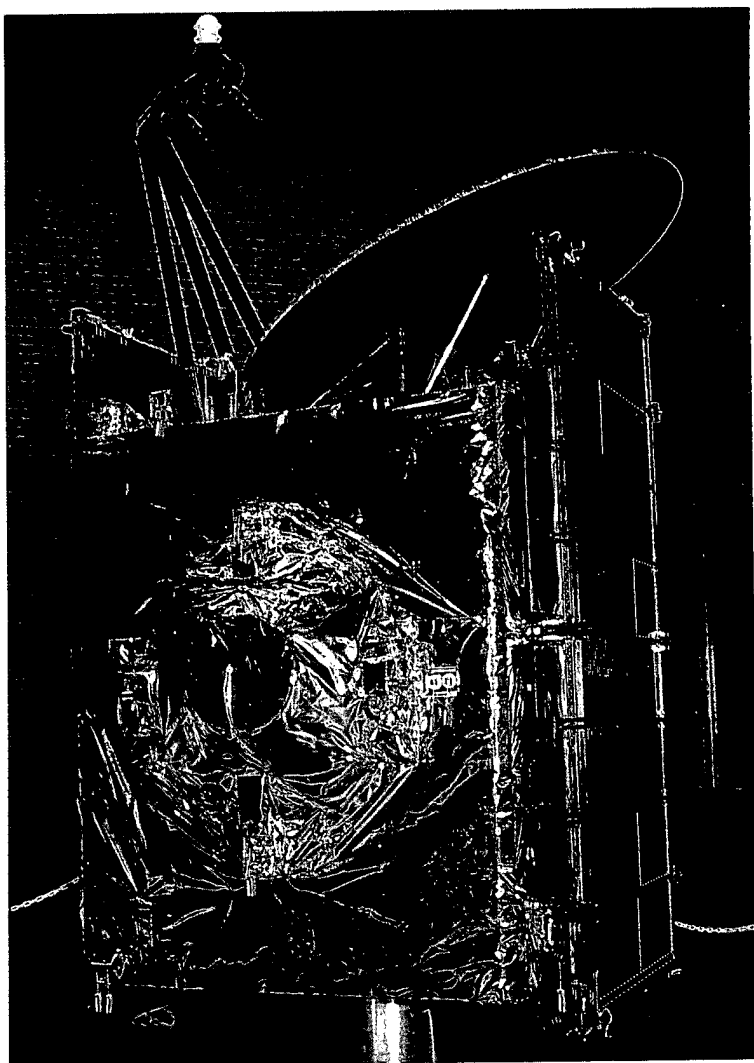
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JAPAN: SATELLITE DEVELOPMENT PROGRAM

Key Points: Japan is implementing a major satellite development and launch program that will extend into the 21st century. The program emphasizes the development of satellites that will provide communications with moving vehicles, serve as relays for other satellites, and gather data on weather and earthquakes, according to Tokyo press reports.

ETS-V

Spearheading the effort to expand and diversify Japan's communications satellite capability, the National Space Development Agency (NASDA) has developed the Engineering Test Satellite (ETS-V). (For information on composite materials used in this satellite, see p 1 of this issue.) Launched in late August, the satellite is equipped with an aeronautical and maritime experimental transponder (AMEX) developed by the Ministry of Transport's Electronic Navigation Research Institute (ENRI), the Ministry



ETS-V satellite

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of Posts and Telecommunications' Radio Research Laboratories (RRL), and NASDA. The ETS-V will be a testbed for the feasibility of establishing satellite communications between a ground station and a moving vehicle as well as between two moving vehicles (in this case, aircraft provided by Japan Airlines).

ETS-VI

In collaboration with Nippon Telephone & Telegraph Corporation (NTT) and RRL, NASDA is also developing the ETS-VI (slated for launch in 1992) to test the feasibility of an inter-satellite data link. Since a satellite in a high orbit is within line of sight and therefore can track and receive data from a satellite in a lower orbit over a long duration, RRL plans to launch the ETS-VI into a 36,000-kilometer geostationary orbit for use as an experimental relay point in conjunction with the NASA Landsat-5. The ETS-VI will be equipped with a new multi-beam phased array antenna.

EDRTS

Contingent upon the success of the ETS-VI mission, NASDA will launch the geostationary Experimental Data Relay and Tracking Satellite (EDRTS) in 1994. Weighing two tons, EDRTS is equipped with a set of five-meter antennas. The satellite will serve as a relay point for sending data to a ground station from a space station or a satellite located on the opposite side of the Earth. EDRTS will be interconnected with similar US (such as NASA's first Tracking and Data Relay Satellite launched in 1983) and European Space Agency (such as ESA's Data Relay Satellite planned for launch in 1995) satellites to form an integrated satellite communications system. In addition, NASDA plans to interconnect the EDRTS with the ADEOS (Advanced Earth Observation Satellite), slated for launch in 1993, and with the Japan Experimental Module (JEM), set for launch in 1995 as part of the international space station program. Two high-Earth-orbit EDRTS vehicles would provide a tracking and data relay capability for any satellite in low-Earth orbit. Project R&D will begin in 1988 with an estimated cost of some 50 billion yen.

Weather & Emergency Satellites

The Meteorological Agency and NASDA are planning to launch the Sunflower-V geostationary meteorological satellite in 1993. Intended as an improved version of the Sunflower-IV (slated for launch in 1989), the satellite will be equipped with an additional infrared camera which will enhance forecasting accuracy by reducing the error in measurements of atmospheric temperature to 0.5 degree (as opposed to the current 3- to 5-degree error). The projected cost for Sunflower-IV is 22 billion yen with Sunflower-V budgeted at 30 billion yen.

The Ministry of Transport is designing a large multi-purpose satellite (as yet undesignated) for launch in 1995. The satellite will (1) serve as a radio beacon by which ships and aircraft can determine their position, (2) relay distress signals, and (3) detect earthquakes by relaying data from seismic observation facilities. Total R&D cost, including launch, is estimated at 50 to 60 billion yen.

The Ministry of Posts & Telecommunications (MPT) and RRL are planning a collaborative effort to develop a Weather Forecast System for Space, slated for implementation early in the next century. The system will measure the sun's electromagnetic waves as part of a study to determine their effect on the Earth's atmosphere, human health (on Earth and in space), space-based instrumentation, and shortwave telecommunications.

Akiko S. X2726/Gary S. X6931

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USSR: FALLOUT MODEL USES CHERNOBYL DATA

Key Points: Soviet scientists have used data from the Chernobyl nuclear accident to develop a model that predicts the spread of radioactive contamination. Based on the model, researchers have concluded that in the event of a similar nuclear accident (and assuming a stable wind direction), 90 percent of atmospherically transported radiation would be distributed in a plume extending about 100 kilometers downwind, according to an article by Yu. Izrael in METEOROLOGIYA I GIDROLOGIYA (No. 7, 87).

Soviet scientists have used a variety of data gathered from the Chernobyl nuclear accident to create a numerical model of the atmospherically transported fallout that would be deposited downwind should a future accident occur at a plant similar in design to the Chernobyl facility. The model can be manipulated to predict "local" radioactive ground contamination for various accident scenarios but does not address transport over distances greater than a 100-kilometer radius.

To calibrate the model, researchers used a map that depicts the surface distribution of gamma-ray intensity (as measured by several airborne gamma-ray surveys) following the Chernobyl accident. The principal factors considered in the model were:

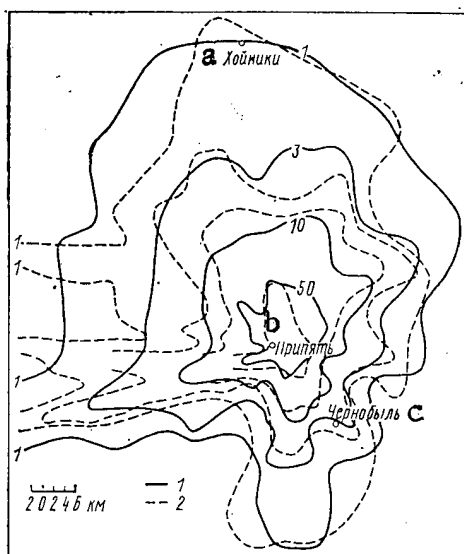
—The size distribution, nature, and total amount of contaminated particles emitted during the accident. This factor can be varied according to the postulated accident, such as a steam explosion or graphite burning.

—The time-dependent height of the radioactive plume.

—The height-dependent directions and velocities of the wind.

—The settling rate of the airborne radioactive particles.

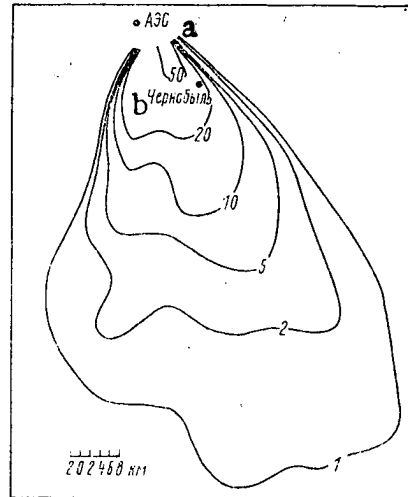
The figure below shows a close agreement between the predicted radiation distribution (1) and the actual spread (2) of the Chernobyl fallout.



Key: a) Khoyniki
b) Prip'yat
c) Chernobyl

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The model was also run based on data from a stable wind condition (as occurred four days after the accident). The resulting map (see below) shows that the principal consequence of such a wind is to produce a single plume that spreads larger amounts of radioactive material further downwind.

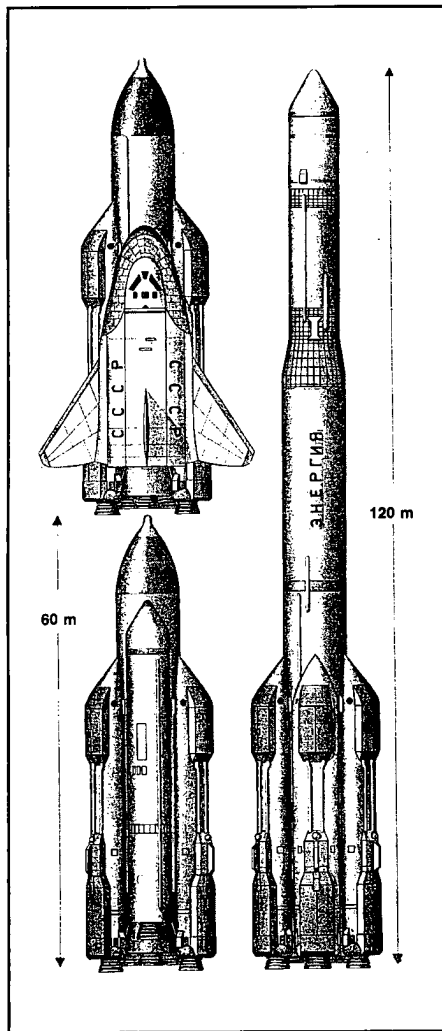


*Key: a) Nuclear power plant
b) Chernobyl*

Norman H. X2725

FOR OFFICIAL USE ONLY**REPORTS**

REPORTS surveys science and technology trends as detailed in articles, books, and journals. It also includes summaries and listings of articles and books which may serve as potential sources for future research. Conference proceedings will occasionally be presented in this section.

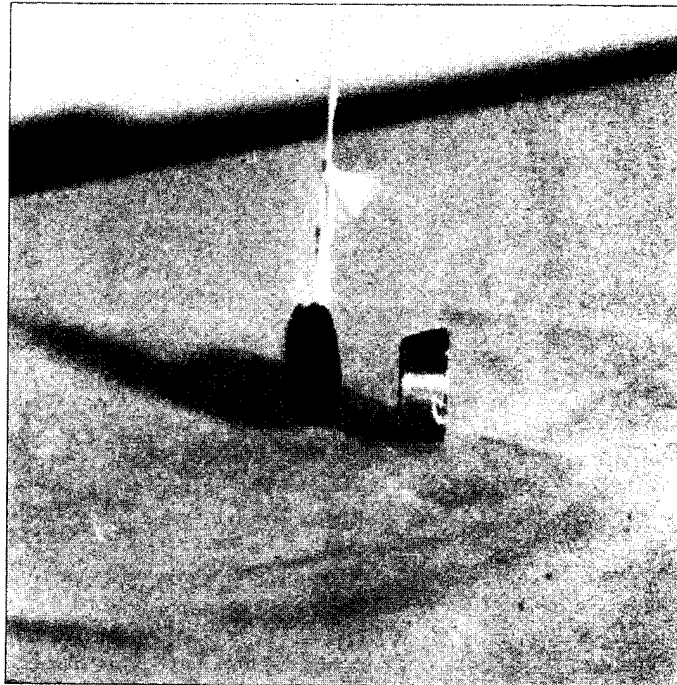
USSR: THREE-STAGE VARIANT OF ENERGIYA BOOSTER

The Soviets have announced a new variant of the Energiya heavy-lift launch vehicle, according to the West German aerospace journal *FLUG REVUE* (Aug 87). The rocket would use six first-stage strap-on boosters and a new third stage mounted in tandem above the second-stage core section. A tandem-mounted payload section would complete the stack and result in a total height of 120 meters (see graphic). This configuration would be twice the height of the Energiya booster flight tested on 15 May (see *PERSPECTIVES* Vol. 2, No. 11, pp 7-10). The shift to a tandem-configured vehicle would provide room for two additional first-stage strap-ons which, together with the third stage, would give this variant of Energiya a payload capacity of at least 150 tons to low earth orbit.

John C. X2725/ Sharon W. X2519

FOR OFFICIAL USE ONLY**BRAZIL: SUPERCONDUCTIVITY RESEARCH**

Superconductivity research in Brazil is centered at the University of Sao Paulo (USP), where the collaboration of four departments has recently resulted in a superconducting ceramic which had a critical temperature of 77K and exhibited diamagnetism, according to MANCHETE (13 Jun). Current density was not reported. The ceramic, a $\text{YBa}_2\text{Cu}_3\text{O}_{6.5}$ compound, was made through fractionation (separation of a mixture in successive stages) and subsequent fusing at 970°C. The photo below shows a sample of the ceramic, frozen in nitrogen and suspended from a thread, being repelled by a magnet.



The four USP departments involved in the development of the new ceramic are the Institutes for the Physics of Materials and for Nuclear Energy Research and the Cryogenics and Synthesis Laboratories. These facilities are reportedly well-equipped, housing high-temperature furnaces, cryogenic devices, and other advanced equipment (not further identified).

Brazilian scientists are also experimenting with other rare earth compounds such as Sm_2O_3 , Tb_4O_7 , La_2O_3 , CeO_2 , and Pr_6O_{11} for superconducting ceramics. Drs. Carlos Castilla Becerra and Spero Penha Morato are reportedly the leading scientists in Brazilian superconductivity efforts, while Giorgio Frossatti and Armando Paduan Filho are mentioned in connection with earlier research (dates not given).

Eva L./Arlene A. X2519

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PREVIEWS

PREVIEWS is an annotated list of selected science and technology items being translated by FBIS for publication in the JPRS report series. The list may also contain previously published items of wide consumer interest.

SCIENCE & TECHNOLOGY/EUROPE & LATIN AMERICA REPORT

ITALIAN INSTITUTES ACCELERATE SUPERCONDUCTOR RESEARCH

The article quotes Prof. Carlo Rizzuto, director of the inter-university consortium on superconductor research, as saying that research at ENEA, IRI, and Ansaldo laboratories has been intensified to keep pace with international competition. The results of an ENEA study on the production and behavior of YBCO (yttrium-barium-copper-oxide) superconductors are outlined. (Florence AS&T RICERCHE E TECNOLOGIE AVANZATE 2 Jul 87/16 Jul 87)

ASEA, BROWN-BOVERI FORM AUTOMATION "SUPERGROUP"

The article describes the group's objective of attaining a leading world position in factory automation, machine tools, electronics, and energy distribution systems. (Milan ITALIA OGGI 11/12 Aug 87)

ITALIAN NATIONAL BIOTECHNOLOGY PROGRAM APPROVED

The article excerpts the text of an Italian S&T Ministry decree of 10 July announcing approval of the national program for biotechnology. Funding will total 209 billion lire. (Rome GAZZETTA UFFICIALE DELLA REPUBBLICA ITALIANA 22 Jul 87)

MBB PLANS FOR SAENGER SPACEPLANE OUTLINED

The article describes the main developmental tasks and operational objectives of the spaceplane project. The two-stage craft will be capable of takeoff from any major airport with a crew of 2 to 6 astronauts and a 2- to 4-ton payload. Plans also envision the ability to carry up to 36 passengers to an orbiting space station. (Florence AS&T RICERCHE E TECNOLOGIE AVANZATE 2 Jul 87)

FRG, UK COMPETING IN SPACEPLANE RESEARCH

The article gives a brief overview of the British HOTOL project and outlines MBB's plan to develop an advanced HOTOL-like spaceplane in addition to Saenger. (Burnham SPACE Jul-Aug 87)

TELECOMMUNICATIONS REPORT

NETHERLANDS MINISTERS DRAFT PTT PRIVATIZATION REGULATIONS

The article discusses four bills drafted by the Dutch Council of Ministers which provide for the founding of PTT Nederland NV in 1989. Private companies will compete with PTT Nederland NV in value-added services. (Amsterdam COMPUTERWORLD 21 Jul 87)

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